

# Math 115

## Worksheet Section 2.6

### Warm-up questions

What does it mean for a function to be differentiable?

Give an example of function that is not differentiable at a point.

**Problem 1.** The graph of  $y = x^3 - 9x^2 - 16x + 1$  has tangent lines with a slope of 5 at two points. Find the coordinates of these points.

**Problem 2.** The height of a sand dune (in cm) is represented by  $f(t) = 700 - 3t^2$ , where  $t$  is measured in years since 2005.

(a) Find  $f(5)$ .

(b) Find  $f'(5)$ .

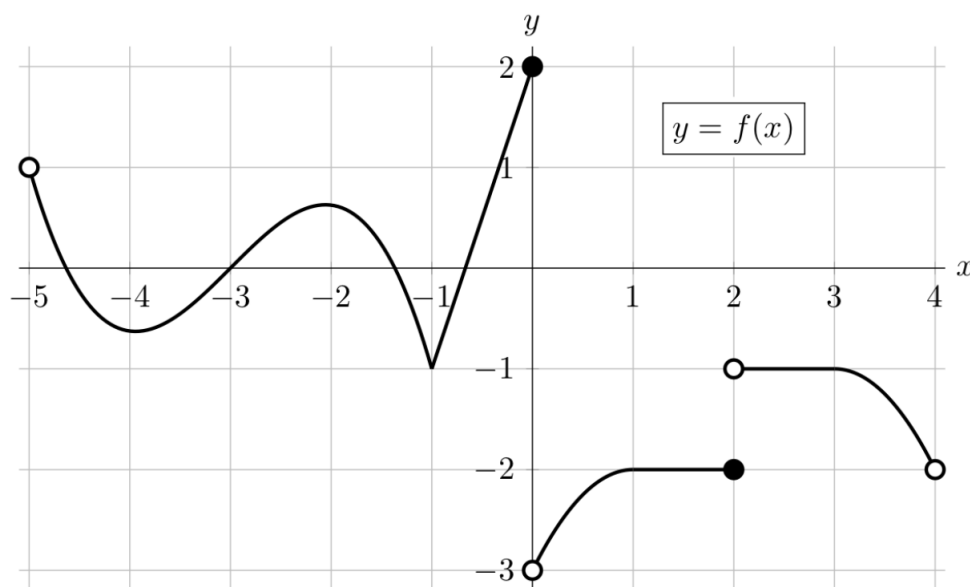
(c) Provide practical interpretations of these two quantities.

**Problem 3.** Using a graph to help you, find the equations of all lines through the origin tangent to the parabola

$$y = x^2 - 2x + 4.$$

Sketch the lines on your graph.

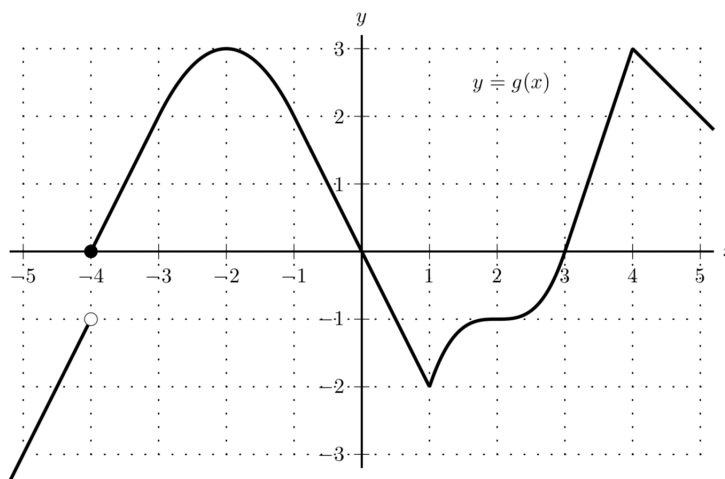
**Problem 4.** (Fall 2016 Exam 2) The graph of a function  $f$  is shown below.



Sketch a graph of  $f'(x)$  (the derivative of the function  $f(x)$ ) on the interval  $-5 < x < 4$ . Be sure that you pay close attention to each of the following:

- Where  $f'$  is defined.
- The value of  $f'(x)$  near each of  $x = -5, -4, -3, -2, -1, 0, 1, 2, 3, 4$ .
- The sign of  $f'$ .
- Where  $f'$  is increasing/decreasing/constant.

**Problem 5.** (Winter 2014 Exam 2) The graph of a function  $g$  is shown below.



Sketch the graph of  $y = g'(x)$ . Be sure that you pay close attention to each of the following:

- Where  $g'$  is defined.
- the value of  $g'(x)$  near each of  $x = -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5$
- The sign of  $g'$ .
- Where  $g'$  is increasing/decreasing/constant.